PROC. ENTOMOL. SOC. WASH.
102(4), 2000, pp. 831–837

A NEW NEOTROPICAL SPECIES OF *CLINODIPLOSIS* (DIPTERA: CECIDOMYIIDAE), AN IMPORTANT NEW PEST OF CULTIVATED PEPPERS (*CAPSICUM* SPP.: SOLANACEAE)

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Abstract.—A new species of cecidomyiid, ***Clinodiplosis capsici* Gagné,** is reported from cultivated sweet and hot pepper in Costa Rica, Guadeloupe, and French Guiana where it appears to have potential as a serious pest. Adults, pupae, and larvae are described, illustrated, and compared to other *Clinodiplosis* species.

Key Words: gall midge, sweet pepper, hot pepper

In the mid-1990s, a new species of gall midge belonging to *Clinodiplosis* was independently discovered on Guadeloupe and in Costa Rica attacking sweet pepper, *Capsicum annuum* L., and hot pepper, *Capsicum frutescens* L. The white larvae of the gall midge cause swellings on stems, leaves, and bases of flowers (Figs. 1–3). Galls can be found all year round and, where locally abundant, the cecidomyiid is a serious pest. Larvae live singly in cells within the swellings. The full grown larva pupates in the gall, the fully developed pupa forms a circular exit hole with the help of the antennal horns, emerging about halfway out of the hole, and the adult immediately emerges from the pupal skin. After adult emergence, the damaged part of the plant is susceptible to rot. Similar galls were later found in 1999 in French Guiana.

In Costa Rica, galls were collected in dry climates as in Guanacaste, wet climates as in Pérez Zeledón, and intermediate climates, such as Alajuela. They were found in gardens, backyards and greenhouses of Guanacaste, Alajuela, and Cartago Provinces, but not in commercial plantations. This absence in the larger plantations may be due to chemical applications intended for the control of the pepper weevil, *Anthonomus eugenii* Caro (Coleoptera: Curculionidae).

The new species of gall midge will readily run to *Clinodiplosis* in the key in Gagné (1994). *Clinodiplosis* is a worldwide genus of some 75 known valid species. Outside the Neotropics, most species of this genus appear not to be host specific and are usually associated with fungus growing in or on plant tissue, such as spent flowers or old galls. A few species, however, are associated with simple bud galls where they are doubtless primary plant feeders (Gagné 1989). While *Clinodiplosis* spp. may also be found associated with fungus in the Neotropics, most known regional species in this

Fig. 1. Galls of *Clinodiplosis capsici* on stems and leaves of *Capsicum* sp.

and closely related genera peculiar to the Neotropics, e.g., *Iatrophobia* and *Schismatodiplosis,* are phytophagous, host specific, and associated with complex galls (Gagné 1989), as is the new species described below.

Methods

Galls with pupae or full-grown larvae were placed in small containers until adults emerged. Specimens of immature stages and reared adults were preserved in 70% isopropyl alcohol. Samples were mounted on microscope slides using the method outlined in Gagné (1989). Terminology for adult morphology follows usage in McAlpine et al. (1981) and for larval morphology that in Gagné (1989). Galls were obtained, adults reared, and other stages secured by H. Blanco-Metzler in Costa Rica

and by J. Etienne in Guadeloupe. J. Etienne also found similar galls in French Guiana. The taxonomic investigation was the responsibility of R. J. Gagné.

Clinodiplosis capsici Gagné, new species
(Figs. 4–15)

Adult.—*Head:* Eyes connate, 11–12 facets long at vertex; facets mostly hexagonoid, all closely adjacent. Occiput with dorsal protuberance with 2 apical setae. Frons with 6–10 setae. Labella ellipsoid and pointed apically, each with several lateral setae. Palpus 4-segmented. Male antennal flagellomeres (Fig. 4) binodal; one circumfilum on basal node, two on the distal, the loops of the three circumfila subequal in length. Female flagellomeres (Fig. 5) cylindrical with long necks, surrounded by two appressed circumfila connected by two longitudinal bands.

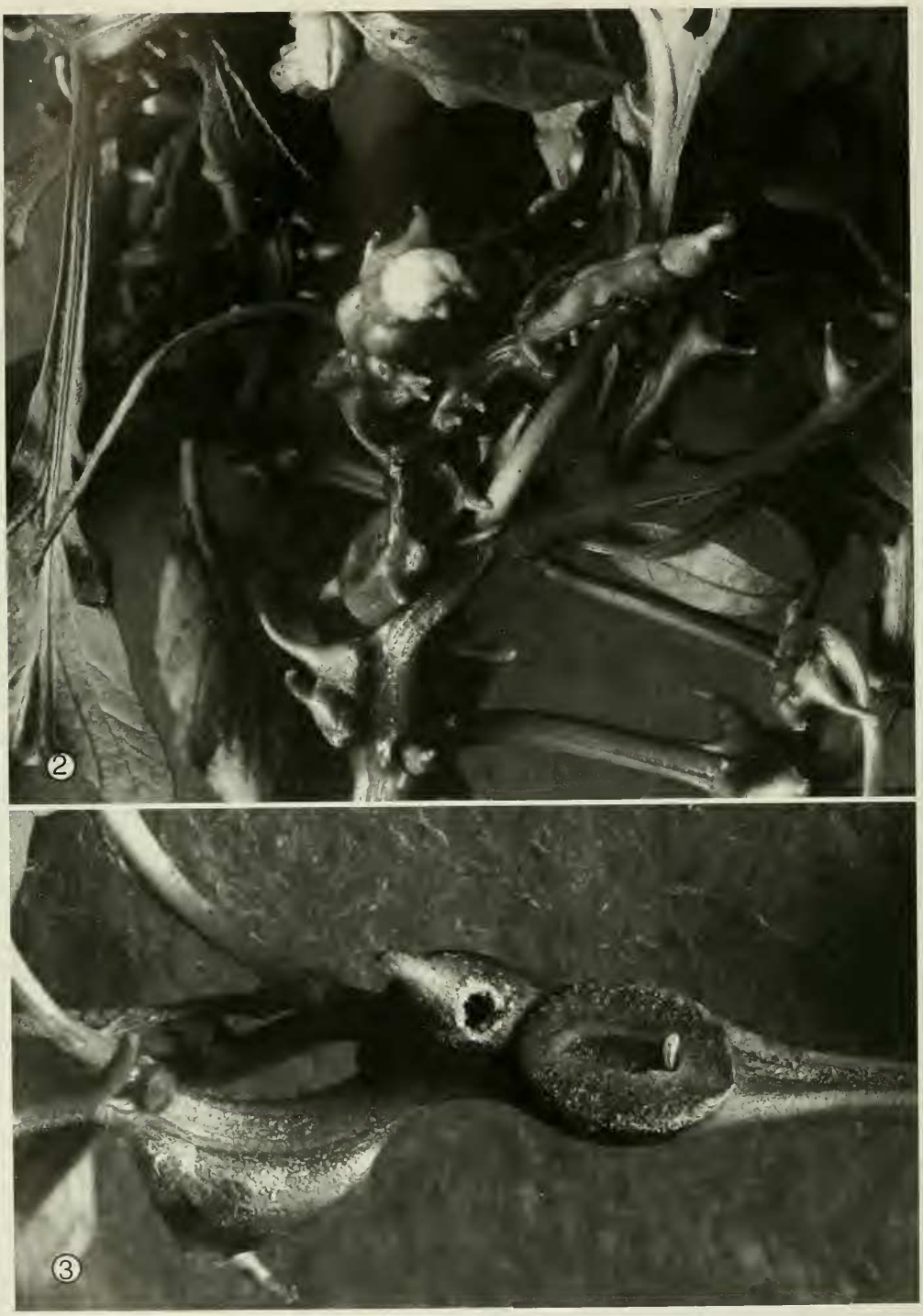
Thorax: Wing unmarked, 2.2 to 2.9 mm long, R_5 curved toward apex, joining C posterior to wing apex. Tarsal claws (Fig. 6) untoothed, curved near basal third; empodia very short, not attaining bend in claws.

Male abdomen: First through sixth tergites entire, rectangular, with single posterior row of setae, several lateral setae, scattered scales, and 2 anterior trichoid sensilla; seventh tergite unsclerotized posteriorly and lacking the posterior row of setae and scales, but lateral setae and anterior pair of trichoid sensilla present; eighth tergite undifferentiated, the only vestiture the anterior pair of trichoid sensilla. First through eighth sternites rectangular, covered with setae and with 2 anterior trichoid sensilla; eighth sternite similar to preceding except weakly sclerotized anterolaterally. Genitalia (Figs. 9–10): cerci rectangular, with posterior setae; hypoproct much longer than cerci, widest at midlength, narrowing beyond midlength and widening again posteriorly, the basal two-thirds expanded laterally to curve slightly around aedeagus, and with strong setae and several smaller ones posterolaterally; aedeagus elongate, narrower and longer than hypoproct, with longitudinal rows of sensory pits; gonocoxite elongate-cylindrical with mesoposterior surface forming nearly right angle; gonostylus elongate-cylindrical, with setulae near base and covered beyond with minute carinae and widely scattered short setae.

Female abdomen (Figs. 7–8): First through seventh tergites entire, rectangular, with mostly single row of posterior setae, several lateral setae, extensively covered with scales, and with 2 anterior trichoid sensilla. Eighth tergite unsclerotized, with mostly single row of posterior setae and anterior pair of trichoid sensilla the only vestiture. Second through seventh sternites quadrate, extensively covered with setae and scales and with anterior pair of trichoid sensilla. Ovipositor slightly protrusible, venter of eighth segment and dorsum of ninth and tenth segments without vestiture, venter of ninth and tenth segments with setae, cercus large, ovoid, with pair of apical sensory setae and scattered setae elsewhere, hypoproct short, narrow, with 2 posterior setae.

Pupa.—*Head* (Figs. 11–12): Antennal base pointed apically, the apex projecting ventrad; cervical sclerite with two elongate setae; face without ventral projections, with 1–2 papillae, one with seta, on each side of base of labrum. Prothoracic spiracle elongate, pointed apically. Abdominal tergites covered dorsally with uniformly small spicules, none enlarged and spiniform.

Third larval instar (Figs. 13–15).—Length, 2.5–2.7 mm. White. Integument with scattered spicules. Antenna about twice as long as wide. Spatula with 2 widely separated anterior teeth, the space between weakly indented. Lateral thoracic papillae in 2 groups of 3 on each side of central line, 2 papillae in each group each with tiny seta. Dorsal and pleural papillae elongate. Terminal segment rounded, with 8 papillae as follows: 1 pair as long as dorsal setae of previous segment; 1 pair with setae about half as long; the two posterior pairs with short, corniform setae, those of inner pair slightly narrower than outer pair.



Figs. 2–3. 2, Galls of *Clinodiplosis capsici* on stems and base of flowers of *Capsicum* sp. 3, Detail of same, one in section to show larva in larval cell.

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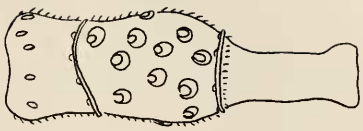

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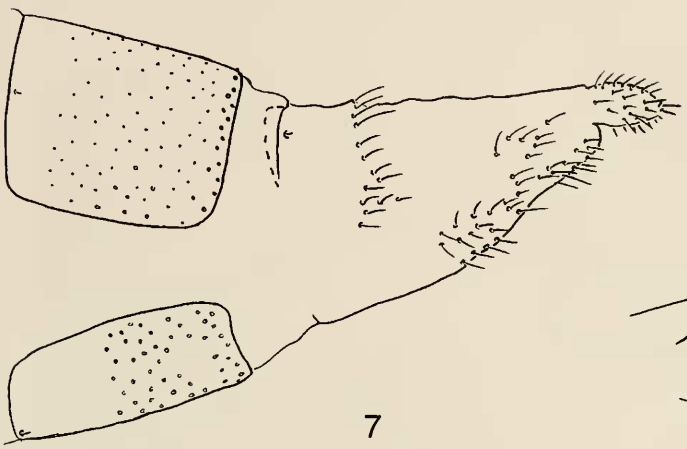

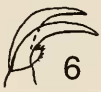

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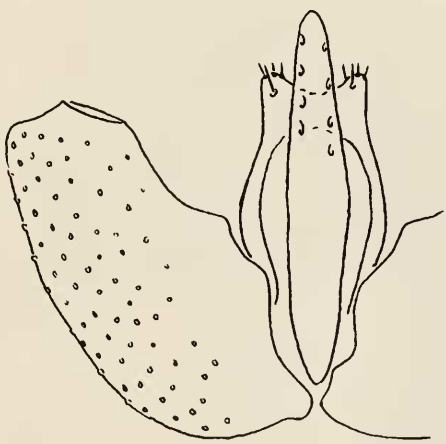

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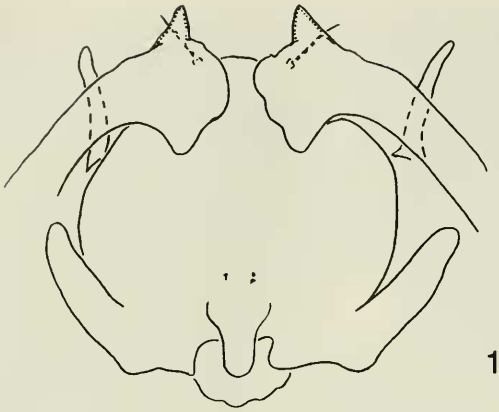
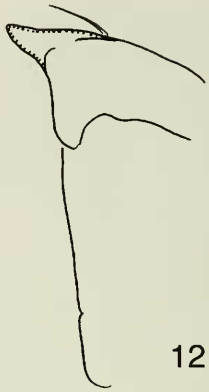
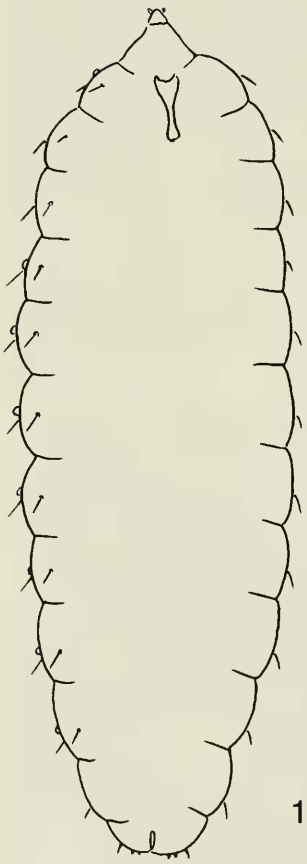
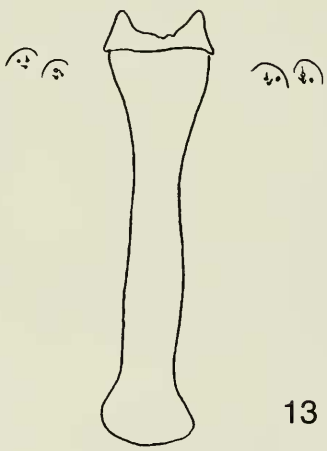
Figs. 4–10. *Clinodiplosis capsici*. 4, Male third antennal flagellomere. 5, Female third antennal flagellomere. 6, Tarsal claws and empodium. 7, Female postabdomen, seventh segment to cerci (lateral). 8, Female cercus, detail (lateral). 9, Male genitalia, only one gonopod shown (dorsal). 10, Same, only one gonocoxite shown (ventral).









Figs. 11–15. *Clinodiplosis capsici*. 11, Pupal head (ventral). 12, Pupal head, part, showing ventral projection of antennal base (lateral). 13, Larval spatula and associated lateral papillae. 14, Larva (ventral). 15, Larval eighth and terminal segments (dorsal).

Holotype.—♂, from *Capsicum frutescens,* Guadeloupe, French Antilles, Ravine Chaude, 27-XII-1994, J. Etienne, GR 1575, deposited in the National Museum of Natural History (USNM), Washington, DC.

Other material examined (all deposited in USNM).—Same data as holotype, 1 ♂, 2 ♀, 3 pupae, 3 larvae; from *Capsicum* sp., Guadeloupe, Ste. Rose, 3-II-1993, J. Etienne, GR 1309, 2 ♂, 2 ♀, 5 pupae, 6 larvae; from *Capsicum* sp., Guadeloupe, Lamentin, 1-VII-1992, J. Etienne, GR 1110, 1 ♂, 1 ♀, 1 pupa, 1 larva; from *Capsicum annuum,* Costa Rica, Guanacaste Province, 3-I-1995, H. Blanco, 1 ♂, 1 ♀; from *Capsicum annuum,* Costa Rica, Turialba, VIII-1995, H. Blanco, 3 ♂, 2 ♀, 3 pupae.

Etymology.—The specific name, *capsici,* means "of capsicum."

Remarks.—The larva of *C. capsici* differs substantially from other *Clinodiplosis* spp. in that the corniform setae of the terminal segment are small and not each situated at the end of lobes, as is usual for the genus. It cannot be said with confidence whether in this species the lack of lobes is primitive or the result of reduction. The male and female of *C. capsici* have the general habitus of the genus, the only peculiarity being the shape of the male hypoproct, which is broadened at midlength, its sides bending slightly around the aedeagus. The pupal abdomen is without dorsal spines and resembles in that way the species of *Clinodiplosis* that feed on fungi. Unlike the new species, several other Neotropical species of *Clinodiplosis* that pupate in their galls, e.g., *Clinodiplosis eupatorii* Felt in conical leaf galls on *Chromolaena* (Asteraceae) (Gagné 1977), have enlarged dorsal spines on the pupal abdomen that are presumably adaptations in those species for escaping from the galls.

Acknowledgments

We thank P. Malikul for making the slide preparations, Lucrecia Rodriguez for computer assistance in making the plates, and, for their comments on drafts of the manuscript: P. Hanson, Universidad de Costa Rica, San José; K.M. Harris, International Institute of Entomology, CAB, London, UK; P. Kolesik, The University of Adelaide, SA, Australia; and A.S. Konstantinov and A.L. Norrbom of the Systematic Entomology Laboratory, USDA, Washington, DC.

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